NRAC - Life Cycle Technology
Insertion Panel Out Brief

Outline of Brief

- **Tasking**
- **Takeaways**
- **Approach**
- **Background**
- **Findings**
  - **Barriers**
  - **Successes / “Best Practices”**
- **Recommendations**

Tasking

- Review / assess appropriate refresh intervals for various technologies critical to Naval weapons & platforms
- Perform studies of successful / unsuccessful attempts to provide for life cycle technology insertion (LCTI)
- Recommend a design philosophy and strategy for ensuring and optimizing life cycle technology insertion
- Assess Navy acquisition practice regarding technology insertion and recommend strategies for improvement

LCTI Study Take-Aways

- **LCTI is not happening efficiently - -**
  Problems are more Management than Technical

- **Tech Insertion lacks effective Systems Engineering**
  - **Human Factors / Human Performance Considerations**
  - **System Interoperability**
  - **Spiral development / changing baselines / OT&E**

- **Expand the Use of Modeling/Simulation Enabling Tools**

- **The FNC Process to Transition S&T is Not Working as Planned**

LCTI Needs "End-to-End" Focused Management
"Create a Technology Insertion Executive Office"

Study Approach

- ***Consider all Phases of LCTI Process***

  Discovery --- Application --- EMD --- Production --- Operations

- ***"Fact finding" focused on Major "Stakeholders"***

  S&T --- PEOs & PMs --- Fleet & FMF Users

  --- Warfare Labs --- OPTEVFOR

  --- OPNAV & Comptroller ---

  --- Prime Integrators ---

- ***Identify Barriers, "Best Practices," Key Technologies and Recommend Improvements***

Sources of Information

Industry
- 3M
- Gartner Group
- Boeing Phantom Works
- General Dynamics
- Lockheed Martin
- Micro Analysis & Design
- Mitre
- Newport News Shipbuilding
- Potomac Institute
- Raytheon

Fleet CINC & Navy Staffs
- CNO Strategic Studies Group
- CINCLANTFLT
- SUBLANT
- Navy Comptroller (Nemfakos)
- NWDC
- OPNAV (N125, N43, N6, N76, N77, N78)

Operational Testing
- OPTEVFOR

Acquisition Community
- COMNAVSEA
- DMSO
- DSMC
- PEO IT (NMCI)
- PEO S (DD21)
- PEO Subs (ARCI)
- PEO T (F/A-18)
- PEO TSC (AEGIS)
- PM (JSF)
- PM NTCSS

Government S&T
- AFRL
- CNR
- DARPA
- Marine Corps Warfighting Lab
- Navy-Industry R&D partnership Council
- NRL
- NSWC Dahlgren
- NUWC
- ONR Dept Heads / Managers

Panel Participants

- Joe Anderson (MajGen USMC Ret)
- Jack Bachkosky (former DUSD AS&C)
- Duncan Brown (JHU/APL)
- Paul Fratarangelo (MajGen USMC Ret)
- Robert Hogan (CAPT USN Ret)
- Joseph Johnson (Florida A&M)
- Douglas Katz (VADM USN Ret)
- Frances Kelly (Consultant)
- Mark Lister (Sarnoff Corp)
- David Robinson (VADM USN Ret)
- Joseph Rodriguez (Raytheon)
- Dick Rumpf (former PDASN)
- Jim Sinnett (Consultant)
- William Slowik (ONR)
- Jerry Smith (former ONR 01)
- Bob Spindel (Dir APL/U of Wash)
- George Webber (Getronics)
- George Windsor (Boeing)

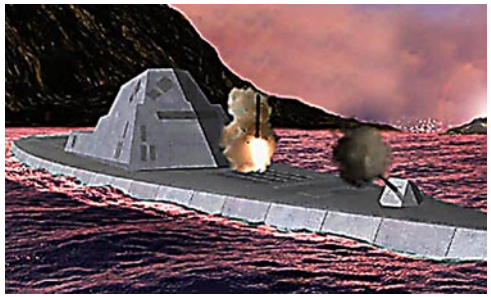
Background – Technology Insertion Objectives

- **Superior force capabilities**
- **Reduced costs**
- **Ability to harvest & integrate technologies in a timely manner from all possible sources**
- **Efficient transition to operational use**
- **Achieve reduced workload / manning & improved quality of service**

We want to deploy/integrate new technology wherever it comes from!

Background – Related Issues and Constraints

- **Legacy Systems vs. New Systems**
  - **Different constraints involved**
- **Technology Insertion vs. Technology Refresh**
  - **Tradeoffs of new capability and life cycle costs**

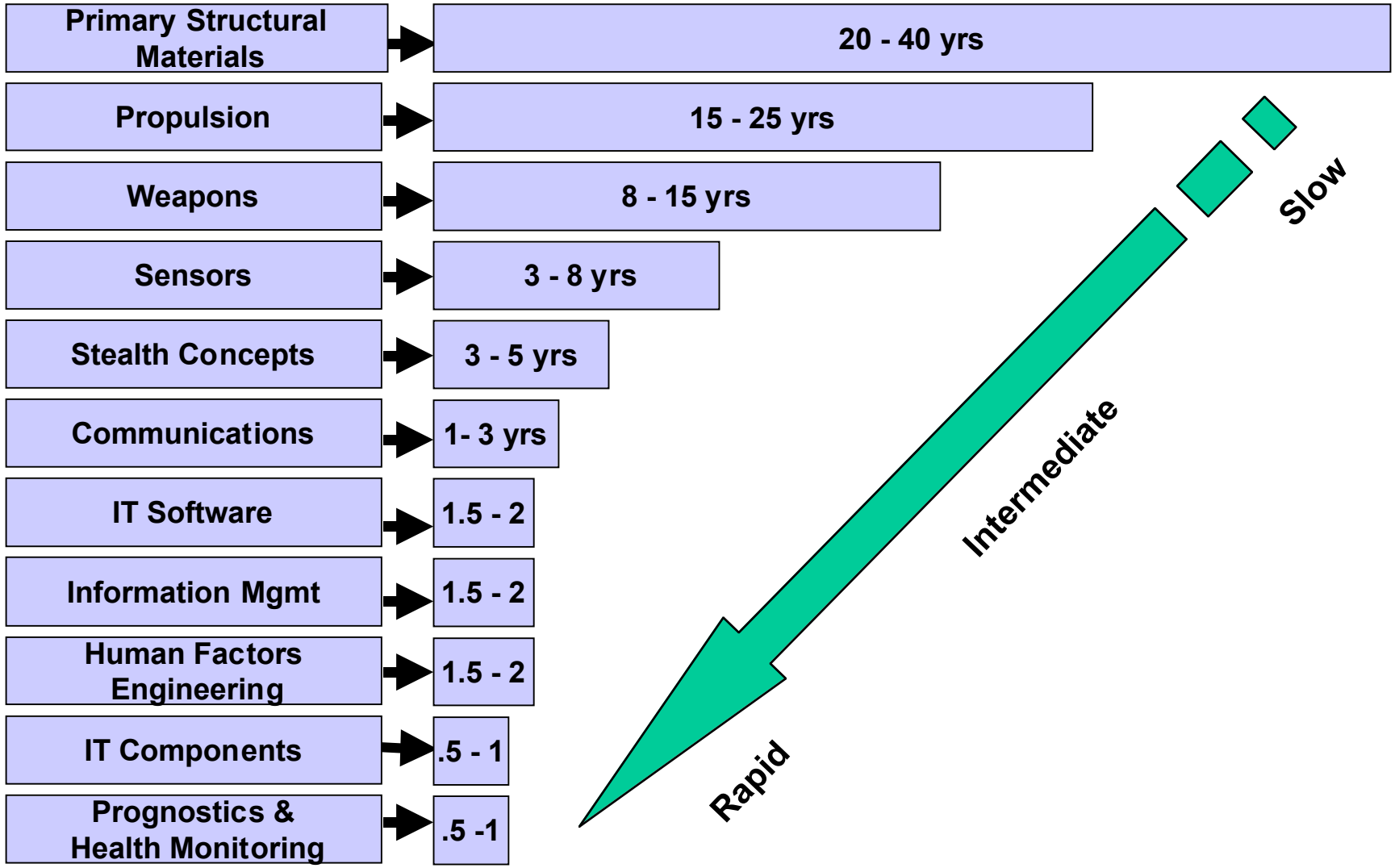


Background - Future Acquisition Environment

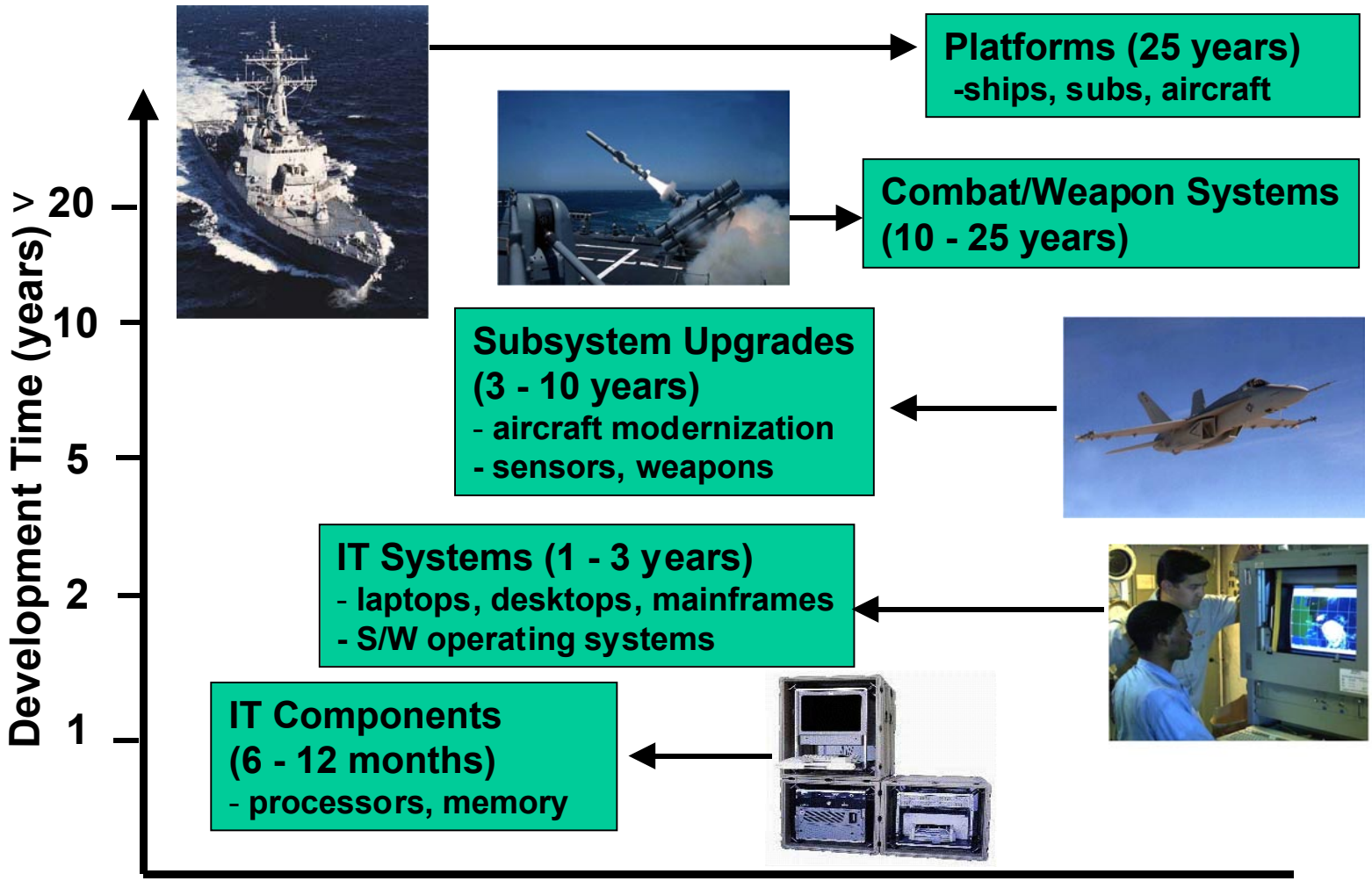
	New	Legacy
• Number of Systems	Few	Many
• Tech Insertion Potential	High	Low
• Budget (POM-02 FYDP)		
• R&D	6%	4%
• Procurement	16%	23%
• O&S	____	≈ 51%
Totals	22%	78%

Tech Insertion Important for both New and Legacy Systems

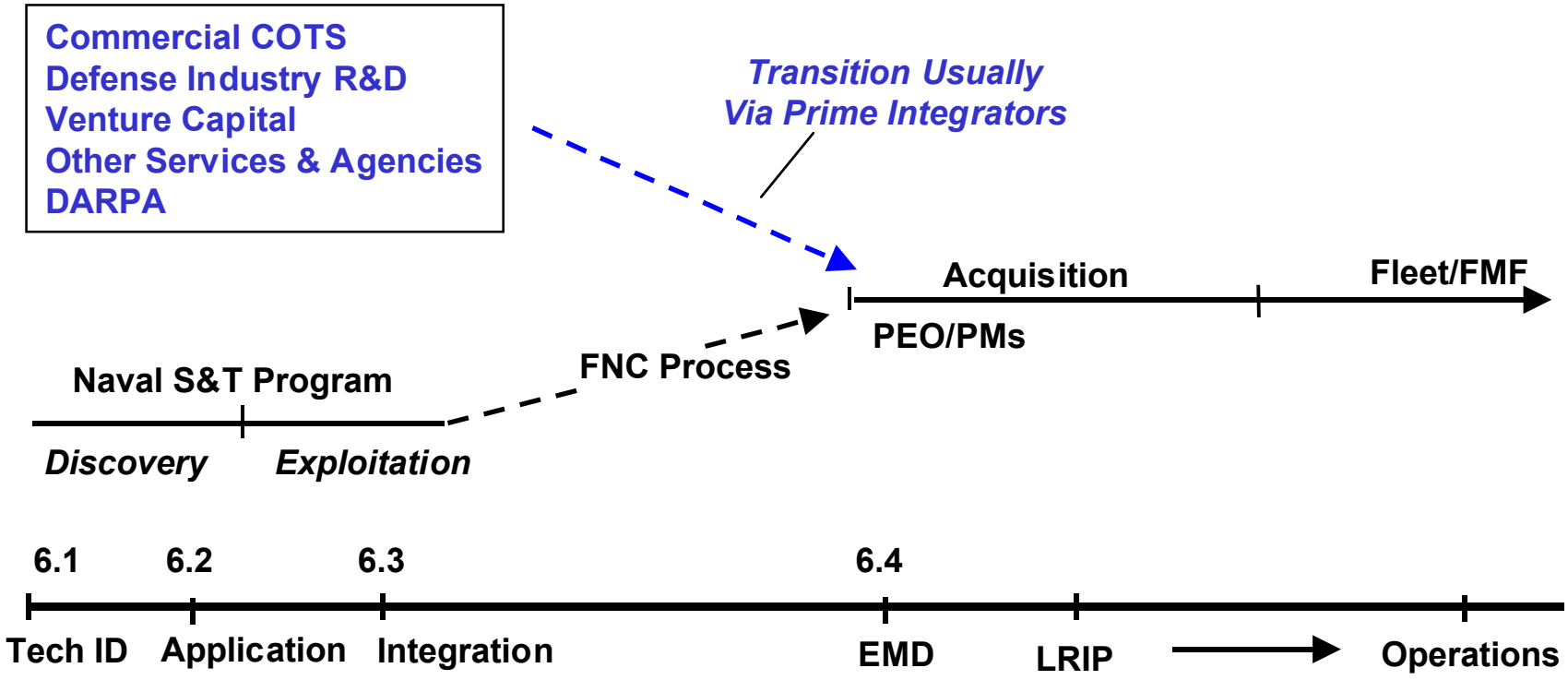
Findings – Technology Categories and Cycles



Findings - Technology vs Platform Cycle Times



Findings – The Technology Exploitation Cycle



- New Technology is available from many sources
- Objective of Future Naval Capabilities (FNC) Program is to facilitate exploitation of Naval S&T

Findings – Current Naval S&T Profile

- **62% of S&T program in "Discovery" (6.1/6.2) + Other**
  - **Basic research**
  - **Work in Navy Core areas**
  - **Work in areas that industry will not work on or does not lead**
- **38% of S&T program in "Exploitation" via Future Naval Capabilities (FNC) Programs (6.2/6.3)**
  - **Applied Research focused on technology shortfalls for systems in or going to acquisition and on Fleet needs**
  - **Harvest industry and DoD S&T and exploit it**
  - **Other Applied Research**

Future readiness dependent on ability to exploit / absorb new technology !

TOR Tasking

Analyze Lessons Learned
From Successful and Unsuccessful
(Problematic) Attempts To Provide for
Life Cycle Technology Insertion

Problems Encountered in LCTI

- Tech Insertion Programs "Short Cut" Good Systems Engineering
  - Human factors / performance design
  - System interoperability analysis
  - Conflicts with spiral development
  - Navy labs are losing system engineering skills
- Lack of Technology Insertion "Enabling" Tools (M&S)
- Lack of Collaboration with OPTEVFOR early on
- Lack of Discretionary Funds and Incentives for "Managed Risk-Taking" by Acquisition PMOs
- Lack of Navy Technology Readiness for Transition to Acquisition

Result can be "Magic Junk"

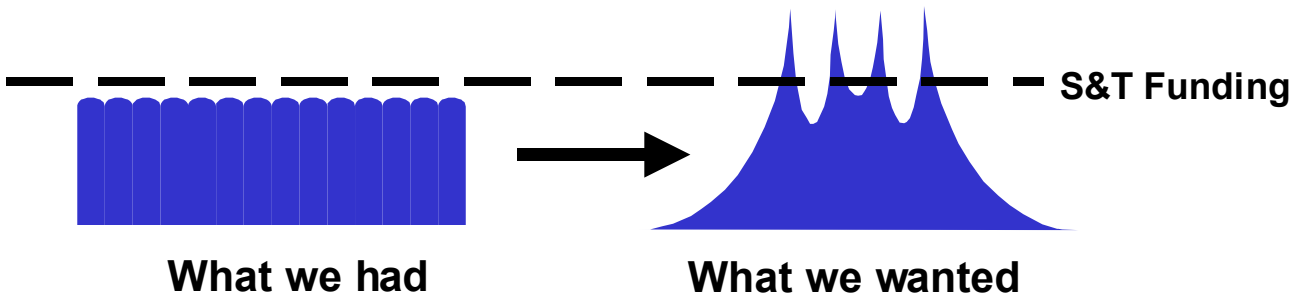
Problems Encountered in LCTI

- **Contracting**
  - **Lack of incentives for Primes / PMs to insert technology**
  - **Long contract lead times vs. technology life cycle times**
- **Funding**
  - **Insufficient "Discretionary" funds for new initiatives**
  - **Diffused authority for resource expenditure, planning & execution**

Technology Exploitation is a Broader Management Issue Than Just S&T

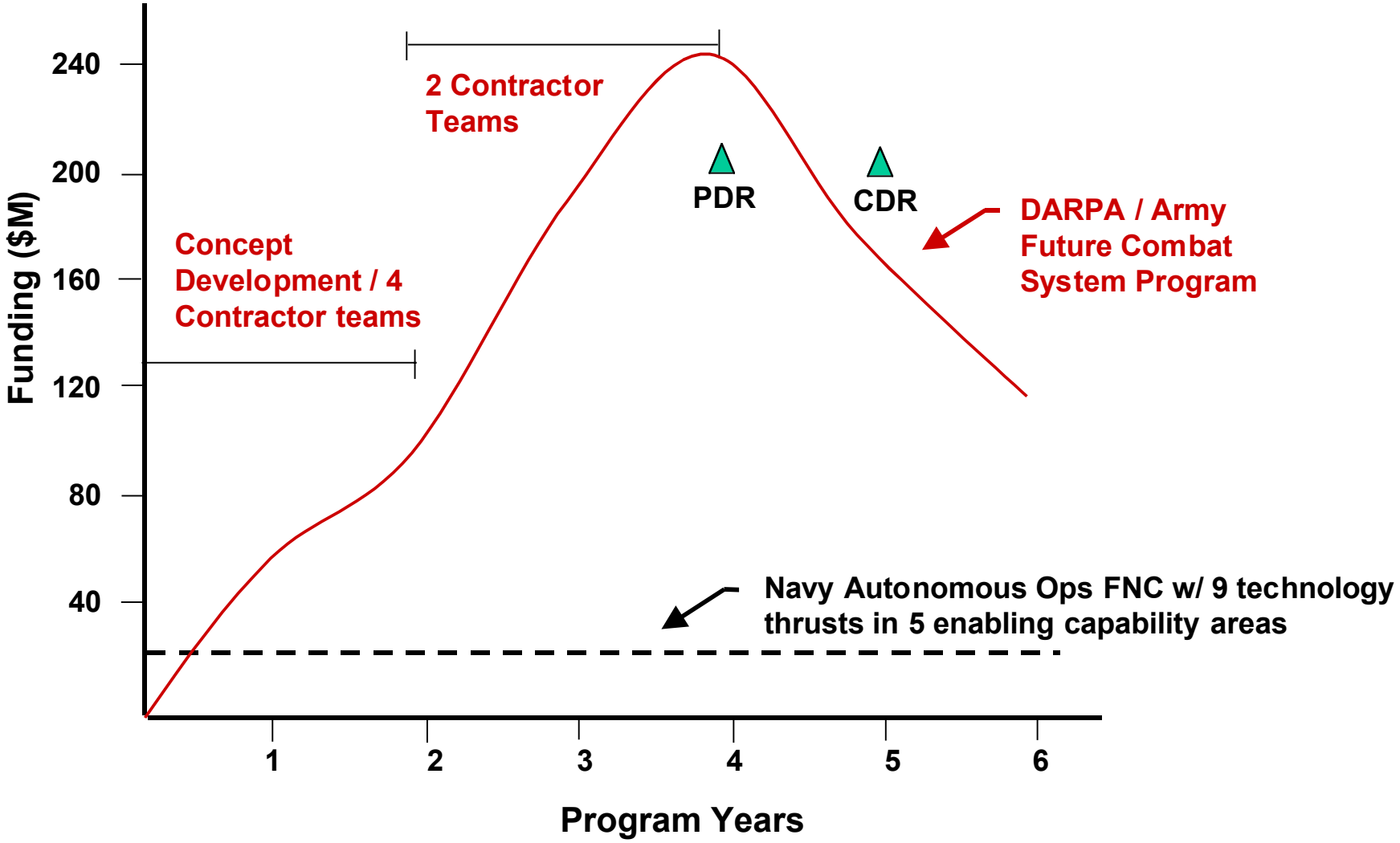
Problems Encountered in LCTI

- **FNC Programs not Structured for Success**
  - **Lack of top level objectives and metrics**
  - **Reviews lack detail for proper decision making**
  - **Limited participation of Fleet and FMF users**
  - **Limited collaboration with Industry Primes to enable early tech exposure**
  - **Naval S&T often competes with Industry solutions as adversaries**
  - **Minimal "harvesting" of outside technology sources (DARPA, etc)**
  - **Lack of critical mass**

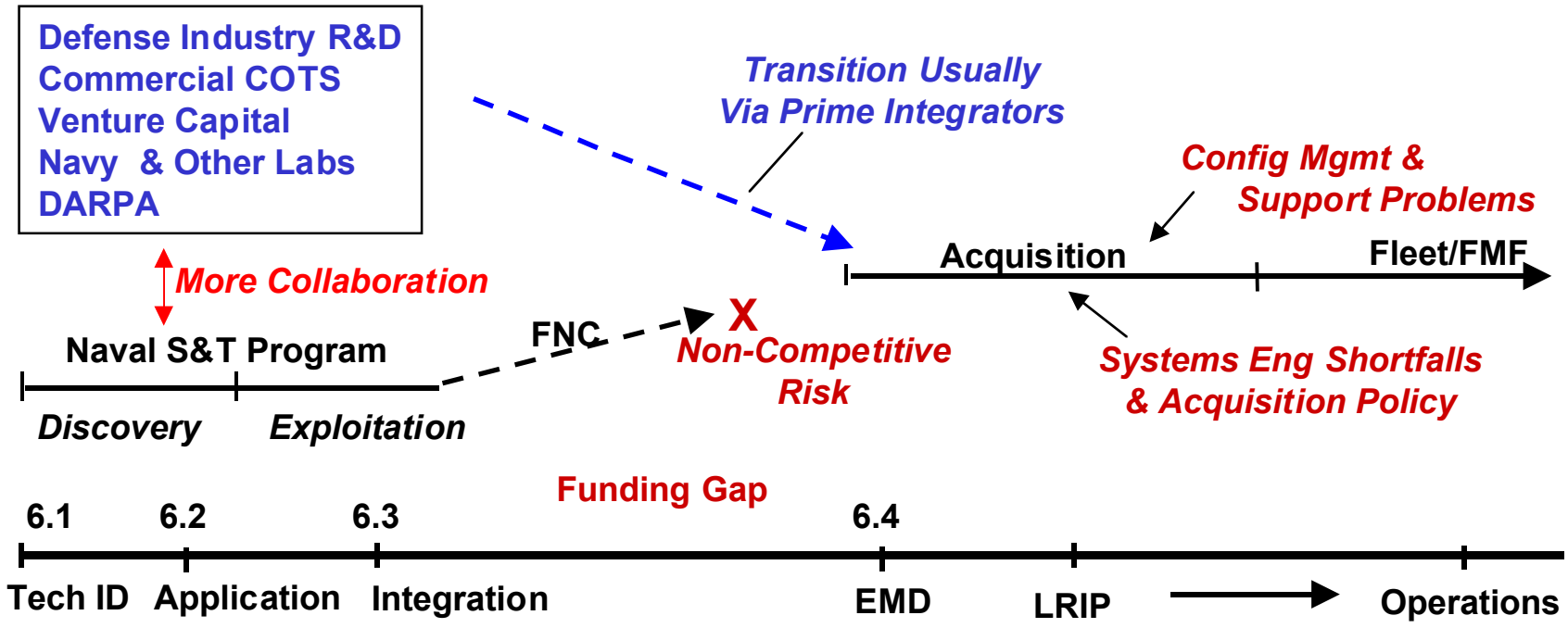


Findings –

Program Strategy Comparisons



Summary – Problems in Technology Transition



Tech Insertion Should Be Managed as an End-to-End Corporate Process

"Best Practices" From Successful Attempts at LCTI

- **Use of "Open Architectures" to Enable Technology Insertion (Highest Payoffs in Software and IT Technologies)**
  - **Acoustic Rapid COTS Insertion (ARCI) Program, F/A18-E/F, JSF, DD 21**
- **Competitive Acquisition Strategies to Incentivise Technology Insertion**
  - **DD 21, NMCI**
  - **ARCI**
- **Systems Engineering Tools to Enable Technology Insertion**
  - **Integrated Command Environment (ICE) Lab (DD 21)**
  - **Distributed Engineering Plant (DEP)**
  - **Modeling & Simulation Tools (Boeing Phantom Works)**
- **Collaborative Environment Tools for Tech Transition Mgmt**
  - **Web-based "Collaboration Portal" Tools (Boeing Phantom Works)**

"Best Practices" Should be Emulated

TOR Tasking

Recommend Strategy / Philosophy Changes
For
Ensuring and Optimizing LCTI

Recommendations

1. Strengthen Systems Engineering Process for LCTI

- **Adopt "Best Design Practices" for New and Legacy Systems**
  - **Open Systems Architecture / COTS**
- **Enhance / Expand M&S "Enabling" Tools as "Corporate Resources"**
  - **Distributed Engineering Plant (DEP) to address system interoperability**
  - **Integrated Command Environment (ICE) Lab to address human factors design**
  - **Use Warfare Labs as focal points**

Recommendations

2. *Develop "Gain Sharing" Incentives for PMs and Primes to Insert New Technology*
   - Primes maintain negotiated profit and share in savings
   - PMs share in portion of savings from technology insertion
3. *Prioritize FNCs to Achieve "Critical Mass" in Resources and Manage Them Like a Business*
   - Demand top level objectives, KPPs, metrics and regular reviews
   - Demand early involvement of Users, Integration Contractors and Outside Technology Sources
   - Implement / use web-based "Collaborative Environment"
   - Leverage DARPA Programs
   - Terminate non performing / non relevant programs
   - Free up funds for new starts (goal 20% per year)

Enabling Prior Recommendations

***** Most Important Recommendation *****

*** Establish "Naval Technology Insertion Executive Office***

- **Promotes "best practices" and "end-to-end" strategies for LCTI**
- **Develops / maintains corporate M&S tools**
- **Promotes collaboration for concept development and early technology Identification**
- **Develops / Promotes "gain sharing" incentive strategies**
- **Promotes joint programs with DARPA**
- **Possesses tech exploitation planning, programming & budget authority**
- **Maintains RDA resource fund for new initiatives**
- **Promotes harvesting and integrating of technology from all sources**
- **Reviews, prioritizes and funds FNC programs**

What's at Stake

- **Efficient transition of $11B+ Naval S&T / R&D**
- **Leveraging of other sources of R&D**
- **Future readiness and capability**

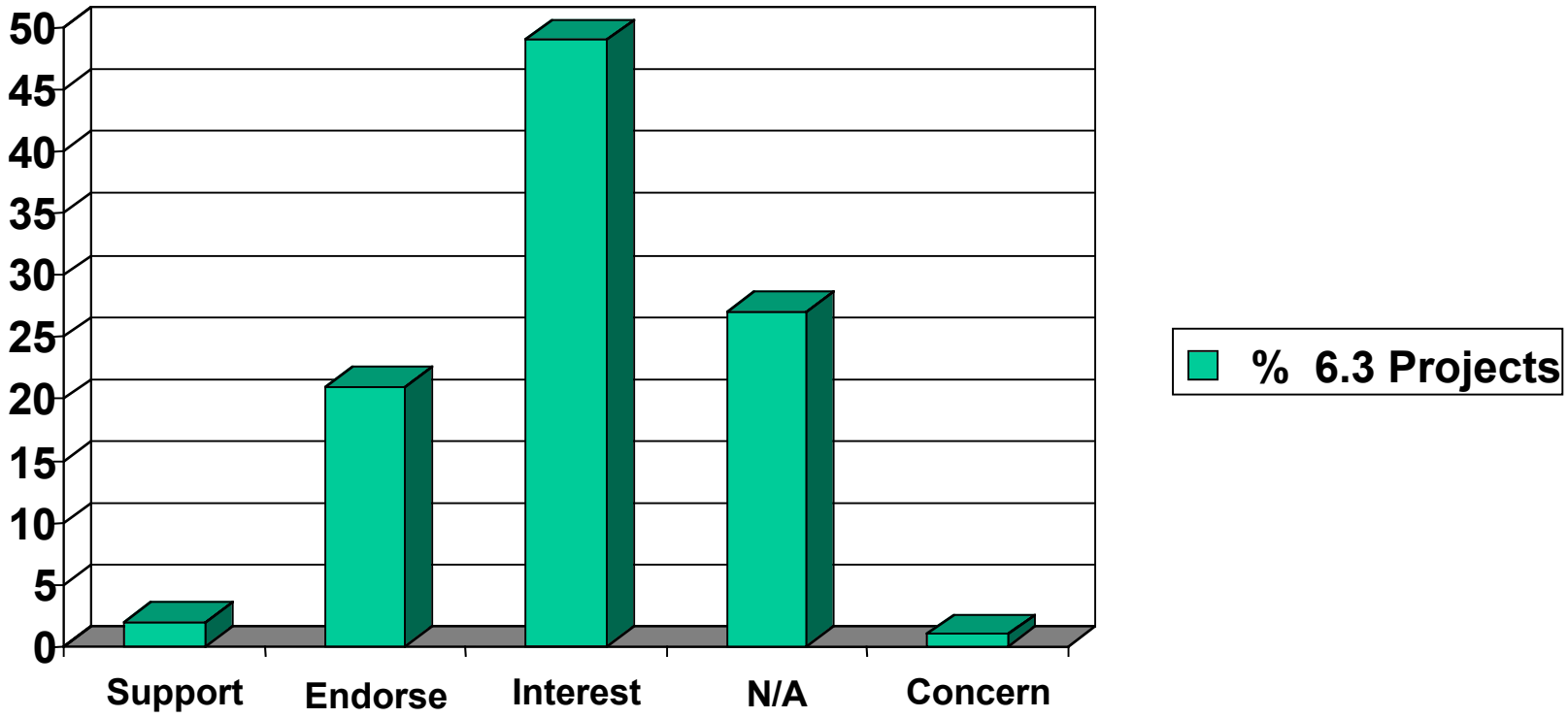
Reinforced by 1986 NRAC Study Recommendations

NRAC LCTI Out Briefing

Backups

Findings –

NAVAIR Response on S&T Transition Potential



Support: High probability of transition, resources will be budgeted
Endorse: High interest. Will be monitored. Transition resources not budgeted
Interest: High potential, but not mature enough to warrant endorsement
N/A: Does not apply
Concern: Concern or conflict